strangulated loop and it has generally been accepted that early distension and stiffening of this coil was the usual occurrence. Rabwin[3] has recently referred to 2 patients with strangulation obstruction in which gaseous shadows failed of demonstration on the X-ray film.

The results of this study indicate that the X-ray is not of the same value in detecting the presence of strangulation as it is in the early recognition of simple obstruction of the intestine.

5057

Observations on the Transfusion of Portal Blood From Dogs With Intestinal Obstruction to Normal Recipients.

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In recent years evidence has accumulated that seriously questions the almost universally accepted belief that the absorption of a toxin from the intestinal canal is responsible for the death of the animal with simple obstruction of the bowel. There exist, however, a few bits of evidence which would substantiate such a belief. Sugito[1] found that blood serum obtained from obstructed dogs when injected into the peritoneal cavity of rats provoked toxic symptoms. Scholefield[2] has obtained results of a similar nature, but it is a noteworthy fact that he found no evidence of a toxic substance in the portal blood until the dogs were in a moribund condition.

In this study, 6 dogs were obstructed by severing and inverting the ends of the bowel in the lower ileum under aseptic conditions. When it was apparent that the obstructed animal was rapidly failing, the abdomen was opened under ether anesthesia and a large mesenteric vein was divided and the portal blood collected into a 3% solution of sodium citrate, (10 cc. per 100 cc. of blood). The blood thus obtained was injected into the external jugular vein of a normal anesthetized dog under aseptic conditions and the blood pressure of the recipient was registered by means of a cannula introduced into the carotid artery. Two other experiments were employed as controls. In one of these, 220 cc. of blood was obtained from the

[3] Rabwin, M. H., *Am. J. Surg.*, 1929, vii, 656.

[1] Sugito, S., *Mitt. a. d. Med. Fak. d. k. Univ. Kyushu. u. Fukuoka.*, 1924, ix, 229.

[2] Scholefield, B. G., *Guy's Hospital Reports*, 1927, lxxvii, 160.

carotid artery of a normal dog and collected in the citrate solution. To this citrated blood 10 mg. of histamine dichloride was added. In the other control experiment, 100 cc. of 1% sodium citrate solution was administered intravenously without the addition of the blood.

The transfusion of the blood from the normal donor to which histamine was added resulted in an immediate and protracted drop of blood pressure to about one-half of the original reading despite the increase in blood volume; 17 minutes later the blood pressure almost regained the initial normal level. The injection of the citrate solution without the addition of the blood resulted in a slight elevation of the blood pressure of the recipient.

In all of the 6 animals transfused with the portal blood of 6 other dogs dying of simple obstruction of the intestine a definite increase of blood pressure was obtained soon after the transfusion was begun. This elevation in blood pressure was sustained for several minutes and then there followed a gradual decline to the normal level. In no instance was there a decrease in pressure following the transfusion of blood. The rise in blood pressure obtained in these experiments is undoubtedly a plethora effect.

Upon completion of the tracings the dogs were returned to their cages and observed for evidence of ill effects. Five of them displayed no unusual symptoms. The last dog in the series, however, died 40 hours after the transfusion. Post mortem examination showed some congestion of the lungs, liver, and spleen and a purulent infection of the wound in the neck, which finding would be adequate cause for the lethal outcome.

TABLE I.

Experiment	Infusion	Amount transferred (cc.)	Days duration of obstruction in donor	Effect on blood pressure in recipient	Result
1	Citrated portal blood from obstructed dog	75	—	Slight elevation	Recovery
2	Same	100	—	" "	"
3	"	200	7	Moderate elevation	"
4	"	200	5	" "	"
5	"	250	3	" "	"
6	"	250	10	" "	Died 40 hrs. later of infection
7	Citrated normal blood plus 10 mg. histamine dichloride	220	No obstruction	Marked depression	Recovery
8	1% sodium citrate solution	100	"	Slight elevation	"

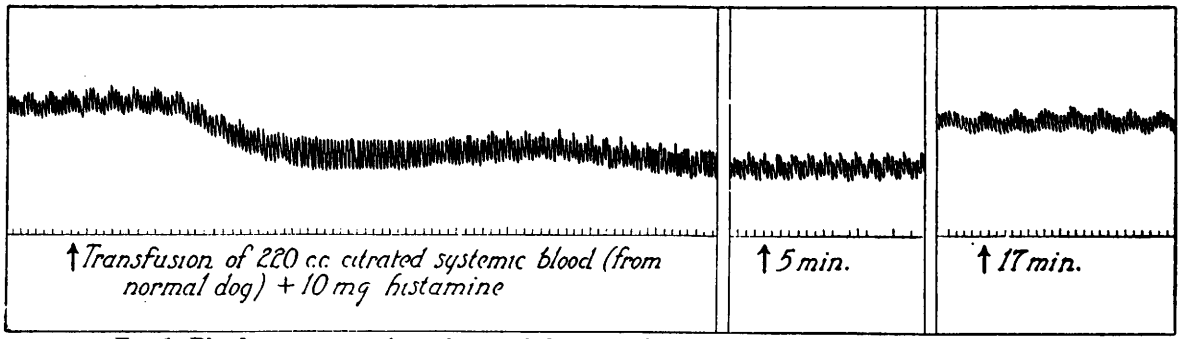

FIG. 1. Blood pressure tracing of normal dog transfused with blood containing histamine.

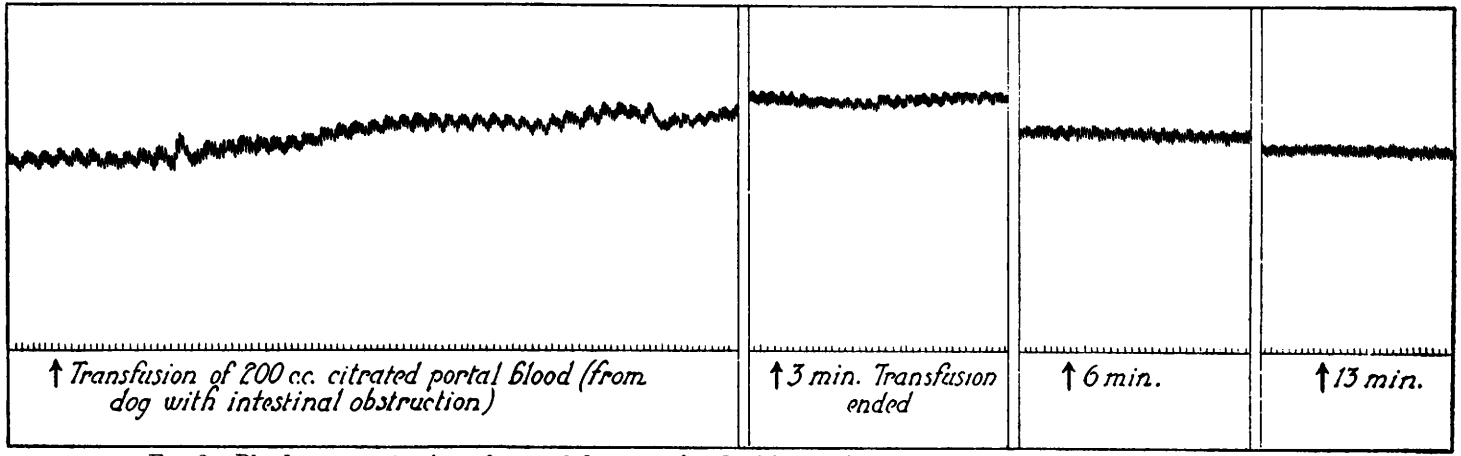

FIG. 2. Blood pressure tracing of normal dog transfused with portal blood from dog with intestinal obstruction.

McLean and Andries[3] and Werelius[4] have previously failed to elicit toxic effects in transfusing normal dogs with systemic blood from dogs with intestinal obstruction. Wangensteen and Loucks[5] were unable to detect evidence of histamine absorption when histamine dichloride was placed in the obstructed bowel. It is a significant fact that in the experiments reported here that portal blood of dogs dying of intestinal obstruction failed to exhibit the physiologic test for histamine; the addition of 10 mg. of histamine dichloride, however, produced immediate and protracted depression of blood pressure.

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Observations on Intestinal Obstruction Following the Intravenous Injection of Particulate Material.

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The cells which are grouped together under the name of the reticulo-endothelial system phagocytose particulate material and destroy or neutralize the action of many soluble toxins present in the circulating blood. The present study was made to observe if a partial blockage of the phagocytic ability of the reticulo-endothelial system had any effect on the length of time an animal would survive following the production of a complete obstruction in the distal portion of the ileum.

Rabbits were selected as most suitable for these experiments. All surgical work was performed under ether anesthesia and with sterile technic. Routine necropsy examinations were made on each animal. To determine the length of time a normal rabbit would live following the production of a complete obstruction in the distal portion of the ileum the following preliminary experiment was performed: In a series of normal rabbits which weighed between 1200 and 3100 gm. a complete obstruction was made by placing a tie of tape 10 cm. proximal to the ileo-cecal valve. Three rabbits lived from 40 to 50 hours; 3 lived from 60 to 70 hours, and 4 lived from 70 to 89 hours after the operative procedure. Forty-four hours

[3] McLean, A., and Andries, R. C., *J. Am. Med. Assn.*, 1912, lix, 1614.

[4] Werelius, A., *J. Am. Med. Assn.*, 1922, lxxix, 535.

[5] Wangensteen, O. H., and Loucks, M., *Arch. Surg.*, 1928, xvi, 1089.